



# Dietary priorities and consumers' views of the healthiness of organic food: purity or flexibility?

Sigrid Denver · Tove Christensen ·  
Jonas Nordström · Kia Ditlevsen ·  
Jørgen Dejgård Jensen · Peter Sandøe

Received: 17 November 2021 / Accepted: 18 May 2022  
© The Author(s), under exclusive licence to Springer Nature B.V. 2022

**Abstract** Previous studies have shown that belief in the healthiness of organic food is a strong motive for buying organic. Typically, a positive relation between a nutritionally balanced diet (with respect to fruit, vegetables and meat) and organic consumption is also found. As market shares of organic food are much smaller than those of conventional food, consumers may face a trade-off between buying organic and choosing the nutritional composition they prefer. Using data from a survey of around 1300 Danish consumers, we found that almost all respondents believed that organic food contains fewer unwanted substances than non-organic food, and that around a third considered organic food to be nutritionally superior. Respondents with high organic consumption and who believe in the nutritious superiority of organic

food products were more likely to belong to a small group of respondents who prioritized buying organic. However, the vast majority, particularly those with low levels of organic consumption, prioritized dietary flexibility over organic produce. Our findings suggest that to motivate those in this large consumer segment to increase their organic consumption, it will be necessary to offer a broader, more nutritionally differentiated, range of organic products.

**Keywords** Organic consumption · Dietary flexibility · Stated preferences · Health characteristics

## Introduction

Demand for organically produced foods has risen over recent years in many countries (Willer et al. 2021). One of the countries with the highest consumption measured per capita is Denmark with 12.1% of food budgets being spent on organic produce in 2019 (Willer et al. 2021). That organic consumption in Denmark has spread to all consumer groups is emphasized in a study by Denver et al. (2018) which shows that only 3% did not report any organic consumption at all, and that 62% of consumers spent more than 2.5% of their food budget on organic varieties.

Many studies have investigated consumers' motives for buying organic food. It has been shown that consumers tend to perceive organic products as healthier than their non-organic counterparts, and that

---

S. Denver (✉) · T. Christensen · J. Nordström ·  
K. Ditlevsen · J. D. Jensen · P. Sandøe  
Department of Food and Resource Economics, University  
of Copenhagen, 1958 Frederiksberg C, Denmark  
e-mail: sd@ifro.ku.dk

J. Nordström  
Agrifood Economics Centre, Lund University,  
220 07 Lund, Sweden

J. Nordström  
Department of Business, Economics and Law, Dalarna  
University, 791 88 Falun, Sweden

P. Sandøe  
Department of Veterinary and Animal Sciences, University  
of Copenhagen, 1870 Frederiksberg C, Denmark

one of the most important motives for buying organic food is concern about one's own health and the health of one's family (e.g. Aertens et al. 2009; Hjelmar 2011; Schleenbecker and Hamm 2013; Gundala and Singh 2021). A meta-analysis by Massey et al. (2018) found that consumers typically perceived advantages of organic food products not only to include that they are produced by methods which are good for the environment and for animals, but also that they are healthier and safer to consume than conventional food products.

But why, exactly, do consumers perceive organic food as healthier than non-organic food? The absence of pesticides (Saba and Messina 2003) and higher levels of nutrients (Lee et al. 2013; Massey et al. 2018) have been cited as health-related reasons for buying organic produce. Organic production standards guarantee that no pesticides and no artificial additives can be used except for a limited number of naturally occurring substances just as the organic standards guarantee a more restrictive use of medicine (European Commission 2008). However, organic production standards make no reference to higher nutrient levels nor do scientific findings unambiguously support the idea that organic products are more nutritious. Hence, judging by nutrient science alone it is difficult, to say the least, to demonstrate any direct, positive health effect of an organic diet (Jespersen et al. 2017; Dangour et al. 2010; Jensen et al. 2013; Huber et al. 2011; Popa et al. 2019; Suci et al. 2019). This mismatch between consumer perceptions and scientific evidence is further complicated by ongoing discussions about how human health is to be defined and, connectedly, how to identify markers for human health.

A study by Ditlevsen et al. (2019) offers a detailed investigation of the health benefits that Danish organic consumers associate with organic products. Based on focus group interviews, the authors found that health perceptions of food among Danish organic consumers are very context sensitive. In particular, the participants associated nutritional health (involving appropriate amounts of vitamins and minerals and a proper balance of the different nutrients) with healthy food *in general*. On the other hand, they associated health of *organic food products* with purity. On the latter understanding, organic food was perceived to be healthier in terms of its being free from pesticides, drug residues and artificial additives. Only one

of the participants in the focus groups voiced the suggestion that organic products were also healthier in containing more nutritious ingredients, such as vitamins, than non-organic products (cf. Ditlevsen et al. 2019; Ditlevsen and Andersen 2021). Hence, while the literature seems to agree on the findings that consumers associate organic food with purity characteristics, the qualitative study by Ditlevsen et al. (2019) suggests that Danish organic consumers do not in general share the perception of the nutritious benefits of organic foods.

With respect to dietary composition, there is reasonably wide consensus that a nutritionally balanced diet is an important prerequisite for maintaining good health. Unbalanced diets with excessive amounts of red meat, fat and sugar, and limited fruit and vegetables constitute an important risk factor in a number of lifestyle-related diseases (WHO 2003; Mozaffarian 2016; Grosso et al. 2017; Saha et al. 2019a, b). Encouraging people to follow official dietary guidelines is therefore a political goal in a majority of countries around the world. According to FAO (2021), more than 100 countries have developed food-based dietary guidelines.

While organic consumption is not part of the dietary guidelines, consumers whose diets include a relatively high proportion of organic products have been found to follow dietary guidelines more closely than non-organic consumers. Thus, households with higher organic consumption typically eat more fruit and vegetables and less meat than those without (Lund and Jensen 2008; Kesse-Guyot et al. 2013; Denver and Christensen 2015; Baudry et al. 2017; Boizot-Szantai et al. 2017; Denver et al. 2019; Christensen et al. 2019).

While previous studies have established a positive correlation between a nutritionally healthy diet (with vegetables and meat) and organic consumption, there has been less effort to understand how consumers choose in situations with limited selections of organic produce. In particular, we have yet to understand how consumers might choose between an organic meal with a pre-set combination of meat and vegetables versus a non-organic meal with a wider diet composition reflected in the relative contents of meat and vegetables.

This potential trade-off is interesting because, despite increasing organic consumption, the total supply of conventional products still by far

surpasses the supply of organic products. Hence, consumers typically have much greater selection of foods to choose from when they buy non-organic food — i.e. more varieties of products with different contents of sugar, fat and proteins. Also, where ready-made meals are concerned, there is a much wider selection of different combinations of meat and vegetables in non-organic food than there is when the choice is restricted to organic food. For example, the consumer might enjoy a wide choice of non-organic ready-made meals while only a few varieties of organic ready-made meals are available in the super markets. In this situation, the consumer faces a choice between organic production, with the perceived advantage of greater purity, on the one hand, and potentially greater flexibility regarding other food characteristics on the other. It seems, then, that for the organic market to expand, a better understanding of consumers' preferences for organic production, as compared with dietary flexibility, is essential. With this improved understanding, we have a better chance of devising and marketing organic products that meet their needs.

An additional complication is that there is little knowledge of how this trade-off might be related to the perceived healthiness of organic products per se. In particular, the knowledge of potential links between perceptions of organic food as being pure and/or nutritious and the trade-off between organics and access to a potentially wider selection of meal combinations will aid the design of new organic varieties that are attractive to different segments of consumers.

Therefore, the aim of the present paper is to explain how consumers prioritize between organic production and dietary flexibility, and how these priorities are linked to perceived health characteristics of organic food, and to the frequency of organic consumption. We address three research questions, using survey data from Denmark as a case. In the first research question (RQ1), we investigate consumer perceptions of organic foods as regards the presence or absence of attributes associated with nutrition and purity. We thereby test the extent to which the qualitative results found by Ditlevsen et al. (2019) can be generalized to a representative sample of the Danish population. Our first research question is formulated as follows:

RQ1: Which health properties do different consumer groups associate with organic foods?

In relation to both the second research question (RQ2) and the third research question (RQ3), we focus mainly on ready-made meals in larger super markets. RQ2 focuses on the choice between organic production and dietary flexibility. As consumers differ in their preferred combinations of meat and vegetables in a meal, having dietary flexibility can lead to different selections among consumers. For example, one consumer might use the flexibility to choose a meal with a preponderance of meat and few vegetables while another chooses the opposite. To obtain a deeper understanding of what kinds of meal consumers have in mind when they say that they want to have flexibility in their diet composition, we analyse how the respondents' choice between an organic versus a non-organic meal with flexibility over dietary content relates to their preferences for different meal combinations. We formulate the problem as follows:

RQ2: How do the respondents prioritize between a meal being organic versus having flexibility in composing the meal — and is the prioritization related to the preferred meal combination?

In putting RQ3, our aim is to learn more about the consumers who prioritize organic meals over dietary flexibility. In particular, we ask whether the respondents' perceptions of the health characteristics of organic food (and a few other central explanatory variables) predict their prioritization of organic production versus dietary flexibility. Thus, the third research question is formulated as follows:

RQ3: Does the prioritization between organic production and dietary flexibility depend on the respondents' perceptions of the health characteristics of organic foods?

The paper is organized in the following way. The materials and methods are presented in 'Materials and methods'. Results are outlined in 'Results'. In 'Discussion', we discuss our findings, and the paper is rounded off with a conclusion in 'Conclusion'.

## Materials and methods

The research questions were investigated using survey data including 1519 respondents from a sample of Danish consumers which was representative of the Danish population in terms of age, geographical distribution (region) and gender. Data were collected in an online consumer survey conducted on August 2017 using Userneeds' pre-recruited web panel (Dinesen 2017). Userneeds has existed since 2003, and its Danish panel has more than 80,000 members. The questionnaire was approved by The Research Ethics Committee for Faculty of Science and Faculty of Health and Medical Sciences, University of Copenhagen (case no.: 504–0285/21–5000). In accordance with Danish legislation, Userneeds collected and handled informed consent from survey respondents. We received the dataset in an anonymized form so that it did not contain any personally identifiable information.

A pilot study involving 100 panel members was used to pre-test the survey for clarity and understandability, with the intention of removing questions that provided insufficient added value. After minor revisions, the questionnaire was published. The average duration of completion of the questionnaire was 9.5 min and the response rate was 21.4%. A minority of 46 respondents spent less than 3 min answering the questions and were excluded from the analysis due to concerns about whether they had considered their answers carefully.

We grouped the respondents according to their stated consumption of organic vegetables. We have chosen to focus on a single product category as it may be easier for the respondent to express themselves about the organic share of a single product than of the organic share of the entire food consumption. We focused on vegetables as the average budget share of organic vegetables in Denmark roughly corresponds to the overall average organic budget share including all products (Denver et al. 2018). Following Christensen et al. (2019), the respondents were divided into four groups in accordance with responses to the following question: 'How often do you and your household buy organic vegetables?' The four groups were defined as follows:

- Non-users: 'Never (0 in 10 times when I buy vegetables)' or 'Rarely (1 in 10 times when I buy vegetables)'
- Occasional users: 'Once in a while (2–4 out of 10 times when I buy vegetables)'
- Engaged users: 'Often (5–8 out of 10 times when I buy vegetables)'
- Passionate users: 'Virtually every time (9–10 times out of 10 times when I buy vegetables)'

In total, 56 respondents indicated that they did not buy vegetables at all ('I never buy that product'), as it was not possible to group these consumers in a meaningful way they were removed from the sample.

In addressing RQ1, we only included respondents who regarded organic products as healthier than non-organic. We therefore excluded the 83 respondents who stated that they completely disagreed with this view. Altogether, 94% of the respondents perceived organic food to be healthier than non-organic food. Among these, the next step was to single out the health dimensions they associated with organic food. In order to quantify how widespread the different health perceptions were in the sample, we used a sequence of responses to the survey question: 'To what extent do you agree or disagree with the following statements that relate to the healthiness of organic products?' The sequence was 'I think organic products are healthier because organic products contain lower quantities of pesticide residues/lower quantities of artificial additives/lower quantities of saturated fatty acids/more nutritious ingredients (vitamins, minerals, etc.) than non-organic products'. The response categories included 'totally agree/partly agree/neither agree nor disagree/partly disagree/totally disagree (on the contrary) / don't know'. The health dimension *purity* was represented by the characteristics 'lower quantities of pesticide residues' and 'lower quantities of artificial additives'. The health dimension *nutrition* was represented by the characteristics 'lower quantities of saturated fatty acids' and 'more nutritious ingredients'. By assessing the share of respondents in the four groups who stated that they agreed or partly agreed that organic products had these characteristics, it was possible to identify the relationship between organic consumption and the different health dimensions associated with organic food.

Research questions RQ2 and RQ3 were both based on enquiries about the respondents' preferences

regarding three dishes of the kind normally served as a main course (Table 1). The dishes consisted either of pasta with meat and/or vegetables in tomato sauce (dish 1 and dish 3) or rice with meat and/or vegetables (dish 2). Each of the three dishes came in four varieties that differed in their content of meat and vegetables. Dishes 1 and 2 included completely meat-free and completely vegetable-free alternatives. All four varieties of dish 3, on the other hand, included at least a small amount of both meat and vegetables. Thus, dish 2 differs from dishes 1 and 3 in containing rice instead of pasta with tomato sauce. By contrast, dish 3 differs from dishes 1 and 2 as it always contains at least a small proportion of both meat and vegetables. The survey respondents were asked to choose their preferred combination of meat and vegetables in the dish. The dishes were presented as part of a meal for four people that could be served for, for example, family or friends. The respondents were randomly assigned to one of the three dishes. This means that in each split the respondents could choose between four combinations as shown in Table 1. In total, 22 respondents did not choose any of the available meals and were therefore removed from the sample. As a consequence we had generated a sample consisting of 1312 respondents to analyse all three research questions.

We used the respondents' answers regarding their favourite combination of meat and vegetables in the described dish as an indicator of the combinations of meat and vegetables they would choose more generally when confronted with dietary flexibility.

After being asked about their favourite combination of meat and vegetables, the respondents were asked to state the degree to which they agreed with the statement 'As long as the meal is organic I don't care about the share of meat and vegetables'. They indicated their agreement with this statement in the

categories: 'totally agree/partly agree/neither agree nor disagree/partly disagree/totally disagree (on the contrary)/don't know'. We then used their answers to address RQ2. Agreement with the statement was taken as an indication that the respondent prioritized organic over dietary flexibility. Participants who stated that they totally, or partly, agreed with the statement were categorized as 'organic first' respondents. The remaining participants were categorized as 'flexibility first' respondents. By assessing the share of respondents belonging to the organic first group it was possible to establish how frequently the respondents prioritized organic production over dietary flexibility. To discover which combination of vegetables and meat the respondents in the organic first and the flexibility first group preferred, we investigated how high a share of respondents in the two groups preferred each of the different combinations. All differences between groups of respondents were tested using two-tailed Fisher's exact tests and were reported as statistically significant if they were significant at a 0.05 significance level at least.

Turning to RQ3, we used a statistical model to deepen our understanding of organic first respondents. We tested the explanatory significance of health perceptions, controlling for other variables that may affect the likelihood of belonging to the organic first group. By using the three different main course dishes, we aimed to overcome the limitations associated with drawing firm conclusions based on a specific dish of this sort.

Inspired by Hosmer et al. (2013), we used a logistic regression model to estimate odds ratios, where an odds-ratio above 1 for an explanatory variable indicates that the variable has a positive impact on consumers' likelihood of belonging to the organic first group. In the regression analysis, the dependent binary variable,  $y$ , takes the value 1 if the respondent

**Table 1** Overview of combinations of meat and vegetables in three main course dishes from which the respondents were asked to choose their favourite

Dish 1: pasta with meat/vegetables in tomato sauce	Dish 2: rice with meat/vegetables	Dish 3: pasta with meat and vegetables in tomato sauce
No meat and 750 g of vegetables	No meat and 750 g of vegetables	50 g of meat and 700 g of vegetables
250 g of meat and 500 g of vegetables	250 g of meat and 500 g of vegetables	250 g of meat and 500 g of vegetables
500 g of meat and 250 g of vegetables	500 g of meat and 250 g of vegetables	500 g of meat and 250 g of vegetables
750 g of meat and no vegetables	750 g of meat and no vegetables	700 g of meat and 50 g of vegetables

belongs to the organic first group and 0 if the respondent belongs to the flexibility first. We assume that there is a linear relationship between the predictor variables and the log-odds of the event that  $y = 1$ . This linear relationship can be written in the following mathematical form:

$$\log \frac{P(y = 1)}{1 - P(y = 1)} = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 \quad (1)$$

where  $\beta_0$  is a constant, and  $\beta_1, \dots, \beta_4$  are parameter vectors to be estimated and are related to four vectors of explanatory variables,  $x_1, \dots, x_4$ . The health characteristics of organic food we considered (low in saturated fatty acids, high in nutritious ingredients, low level pesticide residues and low level of artificial additives) were included in the vector  $x_1$ . These characteristics were categorized as dummy variables with the value 1 if the respondent agreed at least partly that the health characteristic was associated with organic products and 0 otherwise. The four user groups were represented in the vector  $x_2$ . Specifically, the associated variables took the value 1 if the respondent belonged to a specific group and 0 otherwise (the group of Non-users was used as reference group in the estimation). Preferences for different combinations of meat and vegetables in the main course dish were included as three variables in the vector  $x_3$ . The individual variables representing the different combinations of meat and vegetables (shown in Table 1) took the value 1 if the respondent had chosen a specific combination and 0 otherwise (respondents who chose the combination which included the most meat and the fewest vegetables were used as reference). Finally, we accounted for differences between the respondents who were presented with different dishes by including a vector with two dummy variables,  $x_4$ , for, respectively, Dish 1 and Dish 2 (respondents who were presented with Dish 3 were used as reference). All estimations were made in SAS 9.4 and odds ratios were reported as significant if the 95% Wald confidence interval did not contain the value 1.

## Results

In this section, we present the results of the analysis. First, descriptive statistics of the respondents are presented and compared with the Danish population.

Secondly, we address the three research questions one by one.

### Descriptive statistics of survey respondents

The sample used in the analysis consisted of 1312 respondents. The final sample was representative of the Danish population in 2017 in respect of age, geographical distribution (region) and gender, according to the distributions estimated in Statistics Denmark (2018), but the share of those with tertiary education was lower than it is in the Danish population as a whole (Table 2). Comparison of the socio-demographic profiles of the user groups indicated that having higher education and living in the capital was more frequent among user groups with a high level of consumption of organic vegetables than it was among user groups with low consumption of organic vegetables.

### Health characteristics that respondents associate with organic food (RQ1)

We found that when claiming that organic products are healthier than their non-organic counterparts, almost all respondents refer to purity in terms of freedom from pesticides (84% of the sample) and from artificial additives (73%). However, smaller shares of respondents also perceived organic products as containing more vitamins (34%) and lower quantities of saturated fatty acids (16%). Hence, members of this smaller group of consumers associate organic food with a wider set of health properties — one that includes nutritional health as well as purity. When we look at the four organic consumer groups, the results clearly indicate that associating organic food with nutritious properties was more common among the groups with high organic consumption (Fig. 1).

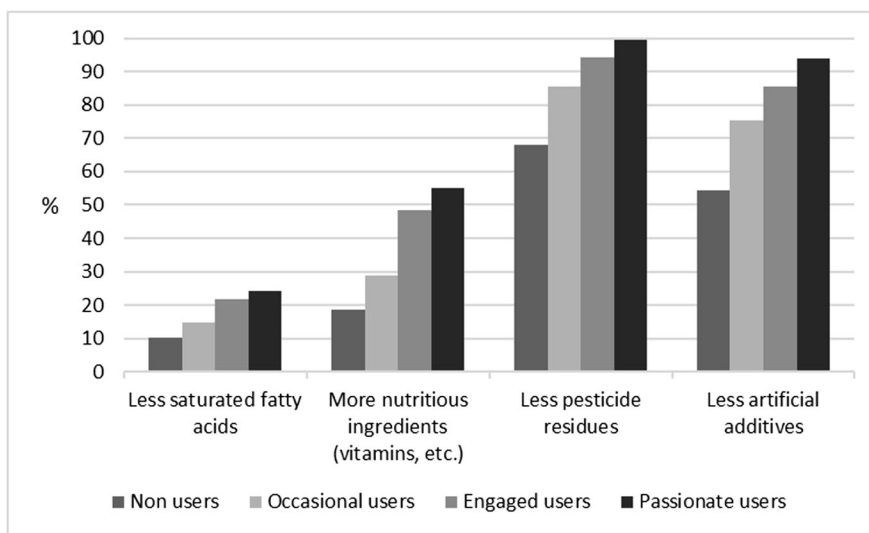
### Respondents' prioritizations of an organic meal and dietary flexibility (RQ2)

Turning to RQ2, we found that the majority of the sample prioritized dietary flexibility over organic production when choosing a main course dish. Only a small group, including around 9% of the respondents in total, preferred organic produce over dietary flexibility and thus belonged to the organic first group.

**Table 2** Descriptive statistics of the survey sample

	Non-users	Occasional users	Engaged users	Passionate users	Survey sample	Danish population 2017 <sup>1</sup>
Age group (%)						
18–39	25	27	33	31	28	32
39–49	30	30	31	29	30	29
50–70	45	42	36	40	42	39
Education (%)						
Higher education	19	25	36	38	28	35
Secondary education	15	15	17	16	16	10
Vocational education	35	32	25	24	31	34
Primary school	28	25	20	19	24	21
Other/do not know	3	2	1	2	2	n.a
Region (%)						
Capital	25	28	39	40	31	32
Zealand	16	10	17	15	14	14
Southern Denmark	25	23	15	18	21	21
Central Jutland	22	27	24	19	24	23
North Jutland	13	12	6	9	10	10
Gender (%)						
Female	50	49	53	53	51	50
Male	50	51	47	47	49	50
Share of respondents (%)	34	29	23	14	100	-

Own calculation based on the survey of 1312 respondents. <sup>1</sup>Source: Statistics Denmark (2018)

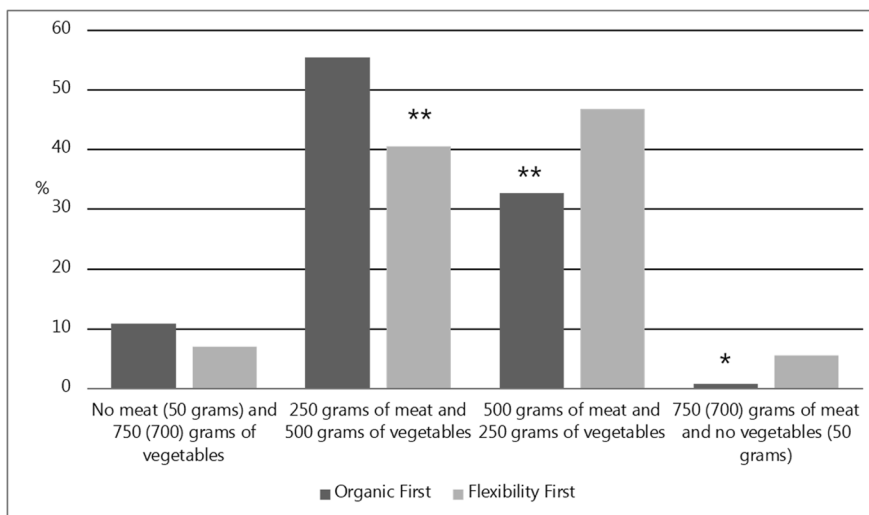


**Fig. 1** Shares of respondents in four organic consumer groups who link the healthiness of organic products with four dimensions of purity and nutritional health. Notes. Based on 1312 respondents. The governing question was, ‘To what extent do you agree or disagree with the following statements? I think

organic products are healthier because of...’ On the scale ‘Totally agree’, ‘partly agree’, ‘no difference’, ‘partly disagree’, ‘totally disagree (on the contrary)’. Columns show the shares of respondents who ‘totally agree or partly agree’

Figure 2 shows distributions of preferred combinations of meat and vegetables among organic first respondents and flexibility first respondents. In

both groups, most respondents prefer the intermediate varieties in terms of meat and vegetables. Below 10% of the respondents in both groups prefer a meal



**Fig. 2** Preferred combinations of specified shares of meat and vegetables in a main course dish. Notes. Based on 1312 respondents. Notation: numbers in () show where dish 3 differs from dishes 1 and 2. The group of organic first respondents comprises 9% of the sample, whereas the group of flexibility first respondents

comprises 91% of the sample. \* and \*\* indicate that the difference between organic first and flexibility first respondents is statistically significant at 0.05 and 0.01 levels, respectively. No asterisk means that the share of organic first and flexibility first are not statistically different at least at 0.05 level



with either no (few) vegetables or no (little) meat. In addition, the results show some interesting differences between the two groups. Respondents in the organic first group are more likely than respondents in the flexibility first group to prefer meals with many vegetables and little meat. Thus, 55% of the organic first respondents prefer a meal with 250 g of meat and 500 g of vegetables, while only 40% of the flexibility first respondents prefer this option. Moreover, one third of the organic first respondents prefer a meal with 500 g of meat and 250 g of vegetables, as against almost half of the flexibility first respondents.

The relation between perceptions of health characteristics of organic foods and prioritization of organic production over dietary flexibility (RQ3)

The impact that the explanatory variables have on the choice between organic production and dietary flexibility is presented in Table 3. The estimated odds ratios indicate whether the individual variables have statistically significant impacts on the likelihood

of consumers prioritizing organics over dietary flexibility.

It can be seen that perceiving organic food as nutritionally healthier because it contains more healthy ingredients such as vitamins and lower quantities of saturated fats significantly increases the likelihood of belonging to the small segment of respondents who were more interested in a meal being organic than in its meat/vegetable composition. In particular, the odds that respondents who take organic products to contain more nutritious ingredients than non-organic products will belong to the organic first group were three times higher than those of respondents who did not believe that organic products contain more nutritious ingredients. Similarly, the odds that respondents who take organic products to contain lower quantities of saturated fatty acids than non-organic products will belong to the organic first group were twice as high as those of respondents who did not believe this. Moreover, and as we expected, belonging to a group with higher organic consumption significantly

**Table 3** Results of a logistic regression analysis of the likelihood of belonging to the organic first group, i.e. prioritizing organic production over dietary flexibility

Variables	Odds ratio	(Wald 95% limits)	
Health perception organic food			
Lower quantities of saturated fatty acids	2.23*	1.39	3.58
More nutritious ingredients (vitamins etc.)	2.91*	1.78	4.75
Lower quantities of pesticide residues	0.62	0.24	1.60
Lower quantities of artificial additives	0.97	0.46	2.04
Organic consumer group (reference: non-users)			
Occasional users	2.18*	1.02	4.65
Engaged users	3.62*	1.72	7.63
Passionate users	9.59*	4.49	20.50
Preferred content of meat and vegetables (reference: 750 (700) grams of meat and no (50 g of) vegetables)			
No (50 g of meat) and 750 (700) g of vegetables	3.90	0.47	32.62
250 g of meat and 500 g of vegetables	6.10	0.79	47.23
500 g of meat and 250 g of vegetables	4.71	0.60	36.75
Main course dishes (reference: dish 3, pasta with 50–700 g of meat and 50–700 g of vegetables in tomato sauce)			
Dish 1, pasta with 0–750 g of meat and 0–750 g of vegetables in tomato sauce	0.82	0.51	1.33
Dish 2, rice with 0–750 g of meat and 0–750 g of vegetables	0.68	0.41	1.14

Based on 1312 respondents. The dependent variable takes the value 1 if the respondent agrees with the statement ‘As long as the meal is organic I don’t care about the share of meat and vegetables’ and 0 otherwise. \* indicates that the 95% Wald confidence interval does not contain the value 1

increased the odds of belonging to the organic first group. With respect to preferred combinations of meat and vegetables, and which of the three main dishes the respondents were presented with, we found no significant differences between the odds of belonging to the organic first group.

## Discussion

Using survey data, we found that almost all organic consumers consider organic products to be purer (in the sense of having less pesticides and less artificial additives) than non-organic products. This result is in many ways in line with the qualitative findings obtained by Ditlevsen et al. (2019).

The survey results showed that one third of all respondents also link organic food with better nutritional composition. Looking at the four user groups defined by the frequency of organic purchase, less than one third of the respondents perceived organic food to be more nutritious in the two user groups with the lowest organic consumption while around half of the respondents in the two user groups with the highest organic consumption were of this belief. Thereby, consumers with the highest consumption of organic food may perceive organic products to contain nutritional attributes which are not guaranteed by the organic standards and for which there is no scientific documentation. A similar result was found in the meta-analysis by Massey et al. (2018) but was only represented with a single voice in the qualitative study by Ditlevsen et al. (2019).

Our results have interesting implications for the marketing of organic products. They indicate that the highlighting of the absence of pesticide residues in organic products may not affect demand among consumers who have high organic consumption, most of whom already perceive this to be the case. Among non-users, almost a third do not associate organic food with fewer residues. This group may be encouraged to buy organic produce by targeted information on the restricted use of chemical pesticides in organic production.

In addition, we found that when Danish respondents have to choose between organic production and dietary flexibility regarding the balance of meat and vegetables, the vast majority belonged to the Flexibility First group and thus prioritized dietary flexibility

over organic production. The results were obtained in settings with three different main course dishes. In the logistic model, the odds of belonging to the organic first group were not significantly different when presented with dish 1, dish 2 or Dish 3. In future studies, it would be interesting to examine in more detail the robustness of these results in other settings. Moreover, the results indicated that respondents with a strong preference for dietary flexibility preferred less nutritionally healthy combinations of the meal containing more meat and fewer vegetables. By contrast, respondents who were loyal consumers of organic food were more likely to choose the nutritionally better alternative involving more vegetables and less meat than other respondents.

There are several policy implications of this study: If the aim is to increase the consumption of organic food, our findings suggest that different strategies should be used to target consumers in organic first and flexibility first groups, respectively. For the smaller group of organic first consumers, who are likely to be passionate or engaged users of organic food, the focus should be on strengthening the supply of healthy organic alternatives. This may include organic ready-made meals with a high content of vegetables relative to meat, including completely vegetarian meals, which would suit consumers' preferences for both purity (obtained by the products being organic) and nutritional healthiness (obtained by the high contents of vegetables). As organic first consumers are willing to compromise on dietary flexibility, it may be acceptable to limit the supply to fewer varieties for this group. If the aim, on the other hand, is to increase organic consumption among flexibility first consumers, who are likely to be occasional or non-users of organic food, our results suggest that marketing strategies should focus more on providing organic options reflecting a preference for dietary flexibility. This may include offering a wider variety of organic ready-made meals with combinations involving larger shares of meat and smaller shares of vegetables than those targeted at the organic first group. Although our results were obtained in a meal context, we expect them to hold for processed products too. At product level, our results appear to point to the need for an increase in the availability of organic animal or vegetarian products with a wide range of nutritional combinations (fat, sugar, proteins, vitamins, etc.). There will, however, be situations where it is not possible to

offer a wide range of organic products. This includes small retailers or cafes that only can offer a limited selection targeting their customer segment.

We also found that high organic consumption and the belief that organic products are superior nutritionally, i.e. contain less saturated fatty acids, increased the likelihood of belonging to the organic first group. Hence, consumers who prioritize organic consumption may perceive organic meals as beneficial both in terms of their purity and their nutritious ingredients. An intriguing finding was that the variables in the purity dimension (the perception of lower quantities of pesticides and artificial additives in organic products) did not explain the likelihood of belonging to the organic first group. We speculate that this lack of explanatory power in the statistical model is due to the fact that most respondents, across the board, tend to associate organic products with purity, and that therefore these variables cannot explain the trade-off between organic and meat/vegetable compositions.

In the study, we focused on perceived health characteristics of organic food because health has been found to be a major motivator of organic consumption. However, it should be noted that the respondents in our study who belonged to the organic first group may have had motives related to benefits of organic products other than health characteristics. They may, for example, have considered organic products to be better for the environment, the climate, or for animal welfare. We know from earlier research that consumers of organic foods are more likely than consumers with lower levels of organic consumption to consider the climate impact and the environmental implications of their food consumption (Ditlevsen et al. 2020; Zander et al. 2013; Hjelmar 2011). If the respondents associated a wide range of benefits with organic products, we cannot, with our current data, assess whether it is health, climate or other concerns that drive the choice of more vegetables and less meat. However, the results suggest that the typical organic consumer is motivated at least partly by the perception that organic food comes with health benefits.

Another potential limitation of the study lies in the use of a stated preference survey. Acquiescence bias — so-called yeah-saying — could therefore have affected the results. It might be suspected that yeah-saying would lead to overestimates of organic consumption and preferences for nutritionally well composed dishes. Although these risks of overstatement

generate a degree of uncertainty about the strength of the derived association between organic consumption and dietary quality, it does not necessarily imply that we have presented a biased description of this association. Although we suggest that it may be possible to increase the demand for organic among the flexibility first group, by offering a wider variety of organic ready-made meals, we did not address this group's willingness-to-pay for organic production. Hence, before we can make firm conclusions about the market potential, it is necessary to examine to which extent consumers with a low organic consumption are willing to pay a price premium for organically produced foods when the dietary composition is more in accordance with their preferred choice. Moreover, it would be relevant to test the robustness of the proportion of respondents who belong to the organic first group. One way of testing the robustness of the group size could be to first ask the respondents to choose between a specific dish produced either organically or non-organically. Afterwards, the group who chose the organic dish would be asked if they would change it to a non-organic dish if they thereby could choose the proportion of meat and vegetables themselves. We urge future studies to include other approaches, such as lab or in-store experiments, or interview-based studies, to (as we hope) increase the robustness of our results on food consumers' trade-offs between buying organic and ensuring a good nutritional composition of their food.

## Conclusion

In a representative sample of the Danish population, 94% of the respondents perceived organic food to be healthier than non-organic food. Most consumers who regard organic food as a healthy choice, perceive healthiness mainly in terms of freedom from drug-residues, pesticides and artificial additives. Around a third of the respondents also considered organic food to be nutritionally better per se than non-organic food. Additionally, the findings indicate that groups with high levels of organic consumption are more likely to associate organic produce with positive health attributes.

When the consumers in our study were asked to state what mattered most to them in choosing a meal — its organic status (representing purity) or its meat/

vegetable composition (representing dietary flexibility) — the vast majority were more interested in the latter. However, we also found that a small group of consumers was likely to prioritize an organically produced meal over flexible meat/vegetable composition. Besides displaying high levels of organic consumption, this small group of respondents was more likely to believe in the nutritional superiority of organic food products over non-organic products.

**Funding** The research reported in this paper has been conducted as part of the OrgHealth project under the Organic RDD2.2 research programme (Project number: 34009–15-1002), funded by the Danish Green Development and Demonstration Programme (GUDP). The funders had no role in the design of the study, in the collection, analyses, or interpretation of data, in the writing of the manuscript, or in the decision to publish the results.

#### Declarations

**Competing Interests** All authors collaborate from time to time with employees from the organic food industry in various projects with no links to the project here reported. All authors declare no other conflicts of interest.

#### References

- Aertens J, Verbeke W, Mondelaers K, Van Huylenbroeck G (2009) Personal determinants of organic food consumption: a review. *Br Food J* 111(10):1140–1167. <https://doi.org/10.1108/00070700910992961>
- Baudry J, Allès B, Péneau S, Touvier M, Méjean C, Hercberg S, Galan P, Lairon D, Kesse-Guyot E (2017) Dietary intakes and diet quality according to levels of organic food consumption by French adults: cross-sectional findings from the NutriNet-Santé Cohort Study. *Public Health Nutr* 20(4):638–648. <https://doi.org/10.1017/S1368980016002718>
- Boizot-Szantai C, Hamza Q, Soler L-G (2017) Organic consumption and diet choice: an analysis based on food purchase data in France. *Appetite* 117:17–28. <https://doi.org/10.1016/j.appet.2017.06.003>
- Christensen T, Denver S, Olsen SB (2019) Consumer preferences for organic food and for the shares of meat and vegetables in an everyday meal. *J Int Food Agribus Mark* 32(3):234–246. <https://doi.org/10.1080/08974438.2019.1599758>
- Dangour AD, Lock K, Hayter A, Aikenhead A, Allen E, Uauy R (2010) Nutrition-related health effects of organic foods: a systematic review. *Am J Clin Nutr* 92(1):203–210. <https://doi.org/10.3945/ajcn.2010.29269>
- Denver S, Christensen T (2015) Organic food and health concerns: a dietary approach using observed data. *NJAS - Wageningen J Life Sci* 74–75:9–15. <https://doi.org/10.1016/j.njas.2015.05.001>
- Denver S, Ditlevsen K, Lassen J, Nordström J, Sandøe P, Christensen T (2018) Relationships between organic consumption and health [Samspil mellem økologisk forbrug og sundhed]. In: Christensen T, Sandøe P (eds) *Increased demand for Danish organic food [Øget efterspørgsel efter danske økologiske fødevarer]* (pp. 11–34). Institute of Food and Resource Economics, January 2018
- Denver S, Nordström J, Christensen T (2019) Is an increase in organic consumption accompanied by a healthier diet? A comparison of changes in eating habits among Danish consumers. *J Food Prod Mark* 25(5):479–499. <https://doi.org/10.1080/10454446.2019.1600449>
- Dinesen A (2017) Note on methods used for the survey to IFRO regarding organic and health. Internal note. Userneeds September 1 2017
- Ditlevsen K, Sandøe P, Lassen J (2019) Healthy food is nutritious, but organic food is healthy because it is pure: the negotiation of healthy food choices by Danish consumers of organic food. *Food Qual Prefer* 71:46–53. <https://doi.org/10.1016/j.foodqual.2018.06.001>
- Ditlevsen K, Denver S, Christensen T, Lassen J (2020) A taste for locally produced food - values, opinions and sociodemographic differences among ‘organic’ and ‘conventional’ consumers. *Appetite* 147. <https://doi.org/10.1016/j.appet.2019.104544>
- Ditlevsen K, Andersen S (2021) The purity of dirt: revisiting Mary Douglas in the light of contemporary consumer interpretations of naturalness, purity and dirt. *Sociology* 55(1):179–196. <https://doi.org/10.1177/0038038520934980>
- European Commission (2008) Commission Regulation (EC) no 889/2008 of 5 September 2008 laying down detailed rules for the implementation of Council Regulation (EC) No 834/2007 on organic production and labelling of organic products with regard to organic production, labelling and control
- FAO (2021) Food-based dietary guidelines. Accessed online November 12, 2021 <http://www.fao.org/nutrition/education/food-dietary-guidelines/en/>
- Grosso G, Bella F, Godos J, Sciacca S, Del Rio D, Ray S, Galvano F, Giovannucci EL (2017) Possible role of diet in cancer: systematic review and multiple meta-analyses of dietary patterns, lifestyle factors, and cancer risk. *Nutr Rev* 75(6):405–419. <https://doi.org/10.1093/nutrit/nux012>
- Gundala RR, Singh A (2021) What motivates consumers to buy organic foods? Results of an empirical study in the United States. *PLoS ONE* 16(9):e0257288. <https://doi.org/10.1371/journal.pone.0257288>
- Hjelmar U (2011) Consumers’ purchase of organic food products. A matter of convenience and reflexive practices. *Appetite* 56:336–344. <https://doi.org/10.1016/j.appet.2010.12.019>
- Hosmer DW, Lemeshow S, Sturdivant RX (2013) *Applied logistic regression*, 3rd edn. Wiley
- Huber M, Rembiałkowska E, Średnicka D, Bügel S, van de Vijver LPL (2011) Organic food and impact on human health: assessing the status quo and prospects of research. *NJAS - Wageningen J Life Sci* 58(3–4):103–109. <https://doi.org/10.1016/j.njas.2011.01.004>

- Jensen MM, Jørgensen H, Lauridsen C (2013) Comparison between organic and conventional agriculture in terms of nutritional quality of food – a critical review. *CAB Rev* 8(045):1–13. <https://doi.org/10.1079/PAVSNNR.20138045>
- Jespersen LM, Baggesen DL, Fog E, Halsnæs K, Hermansen JE, Andreasen L, Strandberg B, Sørensen JT, Halberg N (2017) Contribution of organic farming to public goods in Denmark. *Org Agric* 7:243–266. <https://doi.org/10.1007/s13165-017-0193-7>
- Kesse-Guyot E, Péneau S, Méjean C, Szabo de Edelenyi F, Galan P, Hercberg S, Lairon D (2013) Profiles of organic food consumers in a large sample of French adults: results from the Nutrinet-Santé cohort study. *PLoS One* 8(10):e76998. <https://doi.org/10.1371/journal.pone.0076998>
- Lee WCJ, Shimizu M, Kniffin KM, Wansink B (2013) You taste what you see: do organic labels bias taste perceptions? *Food Qual Prefer* 29(1):33–39. <https://doi.org/10.1016/j.foodqual.2013.01.010>
- Lund TB, Jensen KO (2008) Consumption of organic foods from a life history perspective: an explorative study among Danish consumers, Country Report Denmark. Department of Human Nutrition, University of Copenhagen, Denmark, 2008
- Massey M, O’Cass A, Otahal P (2018) A meta-analytic study of the factor driving the purchase of organic food. *Appetite* 125:418–427. <https://doi.org/10.1016/j.appet.2018.02.029>
- Mozaffarian D (2016) Dietary and Policy Priorities for cardiovascular disease, diabetes, and obesity: a comprehensive review. *Circulation* 133:187–225. <https://doi.org/10.1161/CIRCULATIONAHA.115.018585>
- Popa ME, Mitelut AC, Popa EE, Stan A, Popa VI (2019) Organic foods contribution to nutritional quality and value. *Trends Food Sci Technol* 84:15–18. <https://doi.org/10.1016/j.tifs.2018.01.003>
- Saba A, Messina F (2003) Attitudes towards organic foods and risk/benefit perception associated with pesticides. *Food Qual Prefer* 14:637–645. [https://doi.org/10.1016/S0950-3293\(02\)00188-X](https://doi.org/10.1016/S0950-3293(02)00188-X)
- Saha S, Nordström J, Mattisson I, Nilsson P, Gerdtham UG (2019a) Modelling the effect of compliance with Nordic Nutrition Recommendations on cardiovascular disease and cancer mortality in the Nordic countries. *Nutrients* 11:1434. <https://doi.org/10.3390/nu11061434>
- Saha S, Nordström J, Gerdtham UG, Mattisson I, Nilsson P, Scarborough P (2019b) Prevention of cardiovascular disease and cancer mortality by achieving healthy dietary goals for the Swedish population: a macro simulation modelling study. *Int J Environ Res Public Health* 16(5):890. <https://doi.org/10.3390/ijerph16050890>
- Schleenbecker R, Hamm U (2013) Consumers’ perception of organic product characteristics. A review. *Appetite* 71:420–429. <https://doi.org/10.1016/j.appet.2013.08.020>
- Suciu NA, Ferrari F, Trevisan M (2019) Organic and conventional food: comparison and future research. *Trends Food Sci Technol* 84:49–51. <https://doi.org/10.1016/j.tifs.2018.12.008>
- Willer H, Travnicek J, Meier C, Schlatter B (eds) (2021) *The World of Organic Agriculture. Statistics and Emerging Trends 2021*. Research Institute of Organic Agriculture (FiBL), Frick and IFOAM – Organics International, Bonn. <https://www.fibl.org/fileadmin/documents/shop/1150-organic-world-2021.pdf>
- WHO (2003) Diet, nutrition and the prevention of chronic diseases. Report of the joint WHO/FAO expert consultation. WHO Technical Report Series 916 (TRS 916)
- Zander K, Stolz H, Hamm U (2013) Promising ethical arguments for product differentiation in the organic food sector. A mixed methods research approach. *Appetite* 62:133–142. <https://doi.org/10.1016/j.appet.2012.11.015>

**Publisher’s note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.